DESCRIPTION

BROADCAST FACILITY

The present invention relates to a system and method for communicating a broadcast message over a telecommunications system to a plurality of subscriber terminals and in particular to a system and method that allows the broadcasting of information to a plurality of wireless portable terminals. The system is particularly but not essentially based on the Digital Enhanced Telecommunications (DECT) standard.

It is known to provide telecommunications systems with an audio broadcast facility of some type, depending on the requirements and the capability of the particular system. The message that is broadcast may then be received by a plurality of the system users. One basic system is noted in the English language abstract of Japanese patent application number JP-A-5-48684. The abstract relates to a cordless telephone set having a telephone master set provided with a voice recording part, a radio (transmitting) part and antenna. A plurality of slave sets are provided with an antenna, radio part, an amplifier and a speaker. A recorded voice message may then be transmitted from the master set to the slave sets.

With such an arrangement, if each slave set is provided with only a simple receiver section (radio part), the receiver section may then be required to support not only reception of the broadcast but also support the exchange of normal telephone traffic with the master set. If a slave set is already being used for conducting a telephone conversation, the slave may be incapable of receiving the broadcast unless it is broadcast on the same radio channel that is being used for the communication of the normal telephone conversation traffic, which may be disruptive to the telephone conversation. Furthermore, should a broadcast be transmitted on one common radio channel for reception by all of the slave sets, all slave sets must be set with their receivers configured to receive on this RF channel. Problems then arise when

attempting to exchange telephone traffic information with specific slave sets, especially if a large number of slave sets need to be accommodated within the system. Problems also arise when attempting to transmit a broadcast to particular slave sets.

Another approach to providing an audio broadcast facility to a plurality of terminals in a telecommunications system is for a base station or some other type of control unit to set up a telecommunications link with each terminal of the plurality in a manner that is conventional for the system, that is, the type of link that is used to carry voice or data file traffic. The audio message is then broadcast by sending it over each of the links simultaneously in the same manner that the voice signal of a normal telephone conversation would be carried. Since an individual point-to-point link needs to be established with each terminal simultaneously, this can place a heavy, if not impossible demand on the system which may only be provided with resources sufficient to establish calls to a limited number of terminals at a given time. The problem may be alleviated to some extent by setting up calls to individual terminals of the plurality one by one, or to fractions of the total number of the terminals sequentially, although this will lead to a delay while a broadcast is made to each of the terminals (or fractions of the total number of terminals) for which the broadcast is intended. This may be unacceptable in certain situations and applications, especially if the welfare of personnel using the terminals is somewhat dependant on timely reception of the broadcasts.

In telecommunications systems employing wireless links to portable terminals, attempting to provide a broadcast (such as an audio broadcast) by establishing such traffic calls to a large number of portable terminals simultaneously is even more difficult. This is partly due to the limited number of channels that may be handled by a single base station and the amount of radio spectrum that has been allocated for use by such telecommunication systems. An example of one such system is a DECT compliant telecommunications system (DECT is an abbreviation for Digital Enhanced Cordless Telecommunications). DECT systems are described in the standard ETS 300 175 of which there are several parts. The standard is published by

the European Telecommunication Standards Institute and is incorporated herein by reference.

In a DECT compliant telecommunications system the portable terminal is called the portable part (PP) and the fixed terminal is called the fixed part (FP). The fixed part includes at least one radio fixed part (RFP) which is a radio termination (or radio end point) for communication with the portable part. In this case performing a broadcast call to a number of portable parts by setting up an ordinary voice or data carrying channel (known in DECT as a traffic bearer) to each portable part (PP) would quickly exhaust system capacity and overload system resources. This would result in the inability to broadcast to more than just a few PP's and even the failure to maintain or establish normal voice or data communications to PP's while the broadcast occurs.

It is an object of the present invention to provide a system for the broadcasting of messages such as audio messages or data files over a telecommunications system that allows a plurality of portable terminals to receive the messages that are broadcast.

It is another object of the present invention to provide a system for the broadcasting of messages such as audio messages or data files over a telecommunications system and which allows a plurality of portable terminals to receive messages that are broadcast, while at the same time making efficient use of system resources.

In accordance with a first aspect of the present invention there is provided a broadcast system for communicating a broadcast message in a telecommunications system having at least one fixed terminal for communication with one or more portable terminals, said broadcast system including:

first transmitter means for transmitting a first message from the or each fixed terminal, the message including information specifying a channel, selected for that fixed terminal, to convey the broadcast message;

control means for causing the or each portable terminal to receive on the specified broadcast message channel; and

second transmitter means for transmitting from the fixed terminal the broadcast message on the said specified broadcast message channel for reproduction of the broadcast message by the or each portable terminal, wherein the broadcast message channel is connectionless.

The broadcast messages are typically audio or data file type messages.

The first and second transmitter means may be incorporated in the fixed terminal. Indeed the first and second transmitter means may be the same entity. The first and second transmitter means may be the same system component. The control means may be located in the portable terminal. Each of the first and second transmitter means and control means may be system applications or the like and the terms do not necessarily relate to hardware.

By broadcasting the message as a connectionless message it is possible to transmit substantially simultaneously to a plurality of portable terminals without setting up an individual call to each portable terminal and therefore without exceeding the limitations of the system.

Such a broadcast facility would be of particular use where portable terminals are being carried by security guards or medical workers, where quick substantially simultaneous broadcasting of messages or an alarm signal to personnel is important.

If the telecommunications system is based on the DECT standard the specified broadcast channel may be a DECT physical channel which may then be used to support a DECT simplex bearer. The specified channel can be used to support a connectionless downlink bearer. This has a particular advantage in a DECT compliant system, as the applicants have recognised, since the DECT standard allows for connectionless communications to be set up from the radio fixed parts of the fixed terminals to the portable parts although these connectionless communications are normally only used to carry system information and other control information. This means that little or no extra receiver hardware needs to be added to a basic DECT compliant portable part and off-the-shelf DECT components may be used for enabling

reception of the connectionless messages. In some cases existing hardware will be able to receive the broadcast information providing any message handling procedures are modified accordingly. This allows costs to be kept to a minimum when implementing the features of the present invention. Although basic existing unmodified DECT portable parts will not be able to receive the broadcast messages, their normal operation within the telecommunications system will be unaffected.

Furthermore, if the telecommunications system is a DECT compliant telecommunications system, the first message may be transmitted as a short page message.

The broadcast system may further include:

means for assigning each portable terminal with a broadcast group identity;

means for including broadcast group identity information in the first message; and

means for causing the or each portable terminal to receive on the specified broadcast channel only if the said portable terminal has an assigned broadcast group identity that corresponds to the broadcast group identity transmitted in the first message.

This allows only specific portable terminals to be selected for receiving the broadcast messages. This may be advantageous for calling only certain groups of portable terminals, for example portable terminals carried by people who belong to a particular organisational department or who belong to a particular management level.

The broadcast system may also include means for periodic transmission of the first message for the duration of the broadcast message to allow portable terminals to roam into geographical areas covered by a different fixed terminal and to receive the broadcast from the different fixed terminal even if this requires the roaming portable terminal to receive the broadcast message on a different specified channel and to change the specified channel that it receives on. This offers the obvious advantage of not restricting a user

of a mobile terminal to be in the radio coverage area of a particular fixed terminal in order to continue to receive the broadcast message.

In accordance with a second aspect of the present invention there is provided a method for communicating a broadcast message in a telecommunications system having at least one fixed terminal for communication with one or more portable terminals, said method comprising the steps of:

transmitting a first message from the or each fixed terminal, the message including information specifying a channel, selected for that fixed terminal, to convey the broadcast message;

causing the or each portable terminal to receive on the specified broadcast message channel; and

transmitting from the fixed terminal the broadcast message on the said specified broadcast message channel for reproduction of the broadcast message by the or each portable terminal, wherein the broadcast message channel is connectionless.

In accordance with a further aspect of the present invention there is provided a communications device apparatus having the technical features of the first transmitter means in the broadcast message system.

In accordance with a yet further aspect of the present invention there is provided a communications device apparatus having the technical features of the control means in the broadcast message system.

In accordance with a yet further aspect of the present invention there is provided a communications device apparatus having the technical features of the second transmitter means in the broadcast message system.

Other aspects and optional features of the present invention appear in the appended claims, to which reference should now be made and the disclosure of which is incorporated herein by reference.

The present invention will now be described by way of example only with reference to the accompanying drawing, Figure 1, which shows a

schematic representation of a telecommunications system incorporating the present invention.

The particular communications system shown in the Figure is a DECT compliant cellular communications system 1 in which the fixed terminal takes the form of a DECT fixed part (FP) 2 which includes a plurality of radio end points in the form of DECT radio fixed parts (RFP's) 3. Three such RFP's 3a, 3b, 3c are shown.

The RFP's 3 are networked together and FP 2 is connectable via an interface to external telecommunication networks such as the public switched telephone network 4 although this is optional. The FP also includes a control unit 5 which serves to control the general operation of the whole system including the interoperability of the RFP's 3 with each other. The control unit 5 may also be provided with private automatic branch exchange (PABX) functionality. Although a number of RFP's 3 are used to form a multi cell system, it is possible to provide a single cell system which uses only one RFP 3. In a DECT compliant system a portable terminal takes the form of a portable part (PP) 6 which is capable of establishing communication with the fixed part by establishing a wireless link with a RFP 3a, 3b, 3c. This allows the exchange of traffic such as voice or data, as is well known to the person skilled in the art. Although twelve PP's are shown other numbers may be used. The wireless link communication between an RFP and a PP is provided by so-called bearers which are established on one or more DECT physical channels (channel). Each channel is created by transmitting on one particular slot on one particular radio frequency (RF) in successive time division multiple access (TDMA) frames.

As stated above, a DECT communications system may be provided with one RFP 3 or a number of RFP's 3. Obviously, if the system has only one RFP 3 then this RFP must cater for all connections that are established with the PP's 6. However, in the case of a system having a plurality of RFP's 3, (as is the case for the system illustrated in Figure 1), provided for the purpose of increasing system capacity and/or coverage area, connections are established

between RFP's 3 and PP's 6 depending on the available link quality, which usually though not always results in a link being established between the PP 6 and the nearest RFP 3.

Before the PP6 can participate in traffic communication with the fixed system it needs to attain a condition where it is synchronised with a RFP 3 of the FP 2. This is made possible in a DECT compliant system because each RFP 3 maintains transmissions that carry information relating to the identity of the particular RFP 3 and the FP 2 it is connected with together with system information. Because each RFP 3 is always transmitting such information a PP 6 is able to receive on each DECT system channel in turn and to monitor for activity on those channels.

This transmitted information is called N-channel and Q-channel information as will be understood by the person skilled in the art. For the purpose of clarity it should be mentioned that the DECT N-channel and DECT Q-channel are logical channels and not DECT physical channels.

Because it is the responsibility of the PP 6 to detect the presence of any nearby RFP's 3, when a PP 6 is activated it begins to listen on each DECT channel for N-channel and Q-channel information broadcast by the RFP's 3. If a given RFP 3 is not involved in supporting a traffic connection with a PP then this information is broadcast by itself on a so-called dummy bearer. If a given RFP 3 is involved in supporting one or more traffic connection with one or more PP's 6, the RFP 3 broadcasts this information on each traffic bearer. A RFP 3 supporting at least one traffic connection may drop the dummy bearer although the broadcast of the N-channel and Q-channel information on the dummy must be restored if all traffic connections with that RFP 3 cease. In any case a RFP 3 will always be transmitting N and Q-channel information on at least one DECT channel. The dummy bearer is not intended for reception by a particular PP 6 but is merely for making RFP 3 identity and system information available all of the time to any in-range PP's 6 that happen to be in the vicinity.

When a PP 6 is initially switched on, it listens out for the presence of an in-range RFP 3 by scanning through all the valid DECT channels until if finds

one with some activity. If the RFP 3 is indeed already supporting a voice or data call to one or more other PP then so-called traffic bearers are already established between the RFP 3 and those PP's and the system information will be found in these. This is sufficient to service the PP 6 with the system information that it needs to synchronise with the RFP 3 and be in a condition ready to make or receive calls to it. If however the RFP 3 is not supporting any voice or data calls there will be no traffic bearers and hence PP's 6 in the vicinity of the RFP 3 rely on the so-called dummy bearer transmitted by the RFP 3 at regular intervals on one of the valid DECT channels so that the PP's may synchronise with this.

The PP 6 sets up a so-called synchronisation bearer on the various DECT channels to determine if a nearby RFP is indeed transmitting on that channel. If it is established that this is not the case, a synchronisation bearer is set up on a different DECT channel until a channel is found that is carrying N-channel and Q-channel information. Setting up a synchronisation bearer allows any N-channel and Q-channel information on a DECT channel to be read. This information is used by the PP 6 to determine if it has access rights to the fixed part, and if it does, the PP 6 enters a state in which it is ready to make and receive calls.

A traffic bearer, as is normally used for voice or data communication, operates in a connection oriented mode since it involves the three stages of setting up a connection from one source to one or more destination, transferring data, and finally releasing the connections. In contrast, a dummy bearer operates in a connectionless mode, since it involves the transmission of self contained units of data from one source to one or more destination. A further type of bearer exists and is called a connectionless bearer. It is similar to a dummy bearer, except that while a dummy bearer can only carry system information, the connectionless bearer can carry other types of information. Further information on the nature of these different bearers is given in the above mentioned DECT standard and will not be reproduced herein unless relevant to understanding of the present invention.

Since all types of bearer contain RFP and system information in the form of N-channel and Q-channel information, all PP's in range of and synchronised with a RFP, whatever their present state (for example, engaged with a voice call or in an idle condition), receive and have access to this information. Another type of DECT logical channel is called the P-channel which carries paging information from the RFP to the PP. When paging information is transmitted it also appears on all bearers. Therefore any PP which is able to receive N-channel and Q-channel information will also be able to receive any transmitted P-channel information. Because all synchronised PP's always hear any P-channel information that is transmitted, information is carried on this channel to instruct a particular PP which channel to receive on.

In order to broadcast a message such as an audio message or data file to a particular PP, that PP is first invited to receive on a particular DECT channel that will be used as the broadcast channel for carrying the broadcast information. Once the PP is receiving on that channel the message is transmitted on that channel for reception by the PP. By inviting a plurality of DECT PP's to receive on that channel, all of those PP's will then be able to receive the broadcast message.

A connectionless downlink bearer is set up by each RFP on the broadcast channel, which may be different for each RFP. All PP's in range of a RFP are now capable of receiving the broadcast message simultaneously if they listen to the channel selected on that RFP for carrying the connectionless downlink bearer. As stated above, a connectionless bearer is similar to a dummy bearer, but in this case the connectionless bearer has it's B-field filled with information relating to the broadcast message itself, as will be understood by the person skilled in the art. Although the message may contain voice or data file information, other types of information could be broadcast such as information representing an alarm signal. It is noted that this is in contrast to the concept of establishing a traffic bearer to each in-range PP for which the broadcast message is intended and relaying the message over these traffic bearers. A DECT RFP cluster is only capable of supporting a limited number of traffic bearers and there is an absolute number of traffic bearers that may be

established in a DECT system anyway before frequency reuse becomes necessary. Therefore, by employing a connectionless bearer for carrying the broadcast message, a plurality of PP's may receive the message without unduly loading the telecommunications system.

In order for a given PP to actually receive and reproduce the broadcast message, a first message containing information telling the PP's which DECT channel is being used for the broadcast message is transmitted by each RFP on all bearers as a short page message. The short page message which is transmitted on the P-channel is used to identify the DECT channel that will carry the broadcast message. Short page messages are normally carried in the A-field, as will be known to the person skilled in the art.

In practice, if a dummy bearer is in use by a particular RFP, it is preferable to convert the dummy bearer into a connectionless downlink bearer for carrying the broadcast message thus claiming the DECT channel previously used for carrying the dummy bearer, rather than to set up a connectionless downlink bearer on a different DECT channel. One reason for this preference arises because if a given RFP is transmitting only a dummy bearer, any PP's synchronised with that RFP will be receiving on the DECT channel carrying the dummy bearer. This will generally avoid the need to instruct a PP to receive on a different DECT channel.

It is not always a requirement for all PP's to receive the broadcast message and it is possible to cause the broadcast message to be received by only one of the PP's or a selection of the PP's. PP's may be assigned an identity or group identity, and only those PP's carrying that particular identity may elect to receive the broadcast. This may be achieved in a DECT system by assigning a Group Temporary Portable User Identity (TPUI) to a portable part, or a group of portable parts so that only those PP's having a particular TPUI are invited to receive the broadcast message. More than one TPUI may be employed in the system thus allowing different groups of PP's to be created and independently selected for receiving a broadcast. The TPUI related information is also present in the P-channel and is carried in the short page message, so again, all PP's are capable of receiving this information. The use

of identities and addressing will be known to the person skilled in the art and further information is contained in the DECT standards. Throughout the description, a reference to a TPUI should be read as a reference to a connectionless group TPUI unless the context suggests otherwise. An example of where this is not the case would be a reference to an individual TPUI, as will also be understood by the person skilled in the art.

The MAC layer information in the short page message contains the location of the connectionless bearer, i.e. in terms of time slot and frequency. This may be different for each RFP. The short page message may originate from an application in the RFP. In particular the short page message contains information present in the P-channel; that is the identity of the PP's which should receive the broadcast message, and the DECT channel the broadcast is transmitted on.

The broadcast message may originate from anywhere in the system and for example may originate from the PSTN or from another PP. In the latter case the message is transmitted from the PP to an in-range RFP over a normal traffic bearer, after which the message is broadcast to the other PP's by the mechanism described above. The originator of the broadcast message may specify the group for which the broadcast is intended by forwarding the appropriate TPUI information. In one example this may be generated by the user indicating the intended recipients by entering information via the keypad of the PP.

Each RFP ensures the quality is maintained of the connectionless downlink bearer currently in use. Connectionless bearer hopping may be employed to change to another DECT channel if channel quality is poor. A short page message can be used to inform PP's synchronised with the RFP of the new channel carrying the connectionless bearer. When the connectionless bearer is moved to a different channel, a new page is sent out regularly to inform all of the in range PP's of this. Furthermore, since each connectionless downlink bearer will not necessarily be on the same DECT channel for each RFP, short page messages specifying the location of the connectionless downlink bearer and the broadcast call TPUI information will be sent out

regularly by each RFP for the entire duration of the broadcast message if necessary. This will allow PP's to roam into a cell served by a different RFP which may well be transmitting the connectionless downlink on another DECT channel, and still receive the broadcast message if necessary by receiving on that channel. Connectionless bearer handover could also be implemented in other ways although this may violate the DECT standard.

Because only one connectionless downlink bearer can be established in the system at a given time the system only permits one broadcast message to be sent at a time. Optionally a number of TPUI's may be used, each having a priority value assigned. Should more than one broadcast be demanded simultaneously, the system may then broadcast the message having the highest associated priority value, based on the TPUI that accompanies the message. Where priority values are employed, a PP can be set to receive or reject a broadcast call depending on the priority value associated with the broadcast.

If a PP is already being used for a normal connection based call, the occurrence of a broadcast to that terminal can have a number of effects. For example, a signal could be generated by the portable part alerting the user of the broadcast allowing the user to switch to the broadcast or ignore it. The user could be alerted, for example, by an audio tone or a displayed message. If the user chooses to accept the broadcast, the normal connection based call may be put on hold. Alternatively, the portable part could automatically switch to reproduce the broadcast, perhaps also putting the normal call on hold. The automatic switch could be implemented so that it only occurs if broadcasts have specified associated priority values. A PP may be provided with means for reproducing a broadcast call at a volume which is greater than that employed during a normal connection based call. For this purpose a loudspeaker may be provided in the portable part which may be activated automatically. As stated above, the broadcast could be representative of an alarm signal. Such a broadcast could be initiated by a user of a PP activating an alarm function provided on the PP.

The control unit sends a message to all RFP's containing the group TPUI and which broadcast messages are to be transmitted by the RFP.

The broadcast group identities (which are group TPUI's in the specific example) can be assigned to a PP just after the PP has subscribed, or at location registration when the individual TPUI is assigned. Alternatively, the identity could be assigned at any time since it is permitted to re-arrange a PP into different groups at any time. A PP can be a member of multiple groups.

Although the above description relates to one broadcast message channel, it may be possible to provide further broadcast messages through the addition of other connectionless downlink bearers as described in more detail in our co-pending UK patent application number GB9920324 entitled 'Multiple Broadcast Facility'.

While the present invention is described in some detail with reference to a DECT compliant telecommunications system, it is noted that the invention could be implemented in other telecommunication systems capable of establishing connectionless messaging. In this case portable terminals are instructed to receive the messages using a form of addressing different to DECT TPUI addressing. That is, the target audience of the call is defined by a group identity, which may be programmable for each portable terminal.

From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the design, manufacture and use of systems and devices and component parts thereof and which may be used instead of or in addition to features already described herein.